

## CLAIMS

What is claimed is:

- 5        1. An apparatus for forming multiple-sided containers from flat pre-scored blanks comprising:
  - a) a plurality of pairs of adjustable pinch rollers for engagement with a dunnage sheet at the bottom of a stack of container blanks for removing said sheet from said stack;
  - 10        b) at least one first conveyor for moving said stack from said dunnage removal rollers to a lift;
  - c) a lift for raising said stack;
  - d) a feeder for moving an uppermost blank from said lifted stack into at least one second conveyor, said second conveyor defining a path of travel for said blank through said apparatus;
  - 15        e) a plurality of plows deployed along said path for folding said blank as said first conveyor moves it along said path such that a first and last panel of said blank are positioned in a parallel spaced relationship to each other;
  - f) an adhesive sprayer located along said path downstream from said plows for applying adhesive to one of said first and last panels;
  - 20        g) a separating bar located along said path downstream from said applicator for holding said first and second panels apart after adhesive has been applied;
  - h) at least one alignment conveyor located along said path adjacent to said separating bar that engages a trailing panel of said blank;
  - 25        i) a compression roller located along said path downstream from said separating member and said alignment conveyor for pressing said first and last panels together;

j) a platform having a continuous track around its perimeter located on said path downstream from said compression roller;

5           k) at least one support structure movably engaged with said track for traveling thereon;

l) a rotatable arm pivotally attached to each support structure, each such arm supporting at least one variably operable vacuum attachment device for temporary engagement with said blank;

m) a continuous groove on said platform in the vicinity of said track;

10           n) a movable linkage on said support structure, a first end of said linkage being pivotally attached to said arm, and an opposite end of said linkage being attached to a follower that fits into said groove wherein said linkage is capable of imparting rotation to said arm in response to the movement of said follower in said groove as said support structure travels along a section of said track;

15           o) a plurality of movable mandrels attached to a second continuous track located at the end of said section of said first track wherein each of said mandrels aligns with a corresponding container blank and is temporarily inserted therein;

p) a plurality of folding elements and adhesive applicators for forming the bottom portion of said container while each such mandrel is inserted into a blank; and

20           q) a conveyor for removing formed containers from said machine.

2. The apparatus of claim 1 wherein said rotatable arm is also slidably attached to said support structure allowing for reciprocating vertical movement, a second follower is attached to said arm, and a guide is provided along a section of said track for engagement with said second follower to raise and lower said arm as said support structure travels along said guide.

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3. The apparatus of claim 1 wherein said alignment conveyor is at least one continuous belt with a plurality of adjustably positionable cleats located thereon for engagement with a trailing edge of a panel of said blank, said belt being attached to a motor that is capable of changing speeds to quickly catch up with said first conveyor and thereafter match the speed of said first conveyor.

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4. A method for forming multiple-sided containers from flat blanks comprising the steps of:

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- a) removing a dunnage sheet from the bottom of a stack of said blanks;
- b) moving said stack onto a lifting device;
- c) lifting said stack;
- d) feeding the uppermost blank of said lifted stack into a conveyor defining a formation path through a machine;
- e) folding said blank using a plurality of plows deployed along said path such that a first and last panel of said blank are positioned in a parallel spaced relationship to each other;
- f) applying adhesive to one of said first and last panels;
- g) keeping said first and last panels separated from each other after said adhesive has been applied and while alignment is taking place;
- h) engaging a trailing panel of said blank using an alignment conveyor located along said path to bring said trailing panel into alignment with the other panels of said blank while maintaining separation between said first and last panels; and
- i) compressing said first and last panels together after alignment has been accomplished.

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5. The method of claim 4 comprising the additional steps of:

- j) temporarily engaging said blank with at least one vacuum suction device, said suction device being attached to a support shaft, said shaft being attached to a support structure that travels along a continuous track;
- 5 k) moving said support structure such that said temporarily attached blank travels along a section of said track; and
- l) disengaging said suction device from said blank at the end of said section of track.

10 6. The method of claim 5 wherein a groove is provided in the vicinity of said track, a moveable follower is provided in said groove, said support shaft is rotatable, and a movable linkage is provided between said follower and said support arm.

15 7. The method of claim 6 comprising the additional step of:

- m) rotating said shaft in response to the movement of said follower in said groove as said support structure travels along said track.

20 8. The method of claim 7 wherein said rotatable shaft is also slidably attached to said support structure allowing for reciprocating vertical movement, a second follower is attached to the top of said shaft, and a guide is provided along a section of said track for engagement with said second follower.

25 9. The method of claim 8 comprising the additional step of:

- n) raising and lowering said arm as said support structure travels along said guide.

10. The method of claim 9 wherein said guide is provided within the same section of  
said track where said vacuum suction means temporarily attaches to said container.

11. The method of claim 5 comprising the additional steps of:

5           m) temporarily inserting a moveable mandrel into said blank as it travels  
along a new path following disengagement from said suction device;  
n) folding and adhering panels to form the bottom of said blank;  
o) removing said mandrel from said blank; and  
p) discharging said blank from said machine.

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12. The method of claim 9 comprising the additional steps of:

15           o) temporarily inserting a moveable mandrel into said blank as it travels  
along a new path following disengagement from said suction device;  
p) folding and adhering panels to form the bottom of said blank;  
q) removing said mandrel from said blank; and  
r) discharging said blank from said machine.

13. A method for forming multiple-sided containers from flat blanks comprising the  
steps of:

20           a) feeding the uppermost blank of a stack into a conveyor defining a  
formation path through a machine;  
b) folding said blank using a plurality of plows deployed along said path  
such that a first and last panel of said blank are positioned in a parallel spaced  
relationship to each other;  
c) applying adhesive to one of said first and last panels;  
d) keeping said first and last panels separated from each other after said  
adhesive has been applied and while alignment is taking place;

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e) engaging a trailing panel of said blank using an alignment conveyor located along said path to bring said trailing panel into alignment with the other panels of said blank while maintaining separation between said first and last panels;

5 f) compressing said first and last panels together after alignment has been accomplished;

g) temporarily engaging said blank with at least one vacuum suction device, said suction device being attached to a support shaft, said shaft being attached to a support structure that travels along a continuous track;

10 h) moving said support structure such that said temporarily attached blank travels along a section of said track; and

i) disengaging said suction device from said blank at the end of said section of track.

14. The method of claim 13 comprising the additional steps of:

15 j) temporarily inserting a moveable mandrel into said blank as it travels along a new path following disengagement from said suction device;

k) folding and adhering panels to form the bottom of said blank;

l) removing said mandrel from said blank; and

m) discharging said blank from said machine.

20 15. An apparatus for forming multiple-sided containers from flat pre-scored blanks comprising:

a) a dunnage removal means for removing the bottom sheet of a stack of container blanks;

25 b) at least one first conveying means for moving said stack from said dunnage removal rollers to a lift;

c) a lift means for raising said stack;

d) a feeder means for moving an uppermost blank from said lifted stack into at least one second conveyor means, said second conveyor means defining a path of travel for said blank through said apparatus;

5 e) plow means deployed along said path for folding said blank as said first conveyor moves it along said path such that a first and last panel of said blank are positioned in a parallel spaced relationship to each other;

10 f) an adhesive application means located along said path downstream from said plows for applying adhesive to one of said first and last panels;

15 g) a separating means located along said path downstream from said application means for holding said first and second panels apart after adhesive has been applied;

20 h) at least one alignment means located along said path adjacent to said separating means that engages a trailing panel of said blank;

i) a compression means located along said path downstream from said separating means and said alignment means for pressing said first and last panels together;

j) platform means having a continuous track around its perimeter located on said path downstream from said compression means;

25 k) at least one support means movably engaged with said track for traveling thereon;

l) a rotatable arm means pivotally attached to each support means, each such arm means supporting at least one variably operable vacuum attachment means for temporary engagement with said blank;

m) groove means on said platform in the vicinity of said track;

n) movable linkage means on said support means, a first end of said linkage being pivotally attached to said arm means, and an opposite end of said linkage being attached to a following means that fits into said groove means wherein said linkage is

capable of imparting rotation to said arm means in response to the movement of said following means in said groove means as said support means travels along a section of said track;

5           o)       a plurality of movable mandrel means attached to a second continuous track located at the end of said section of said first track wherein each of said mandrel means aligns with a corresponding container blank and is temporarily inserted therein;

              p)       a plurality of folding means and adhesive application means for forming the bottom portion of said container while each such mandrel means is inserted into a blank; and

10           q)       a third conveying means for removing formed containers from said machine.